

## Chapter Ch.5 Relations and Functions

## 5.5 - Graphs of Relations and Functions

We know the relation  $y=2x$  is a function because each value of  $x$  associates with exactly one  $y$ -value, each ordered pair has a different 1<sup>st</sup> element.

You should be able to express the domain and range of any function using:

## ☆ Words

☆ *set notation*

☆ *interval notation*

*Set Notation – sometimes used*

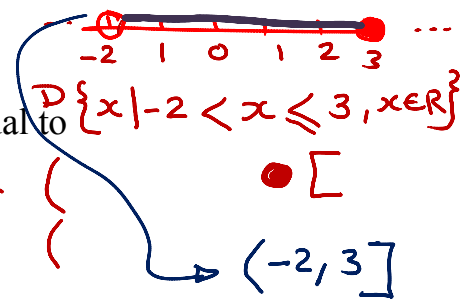
 $\{ \}$ 

D: Domain  
R: Range

R: Range

○ > <  
● ≥ ≤

- D stands for domain, R stands for range      Brackets { } are used for set notation
  - $x \in \mathbb{R}$  means all real numbers       $x \in \mathbb{R}$
  - $<$  less than       $>$  greater than
  - $\geq$  greater than or equal to       $\leq$  less than or equal to
  - $< x <$  between two values not including the values       $\propto$  (       $\bullet$  [
  - $\leq x \leq$  between two values including the values       $\cap$  (       $\bullet$  [
- 



## Examples

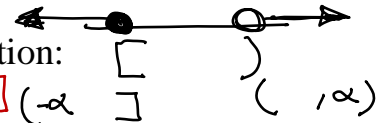
- $D = \{ -6 < x \leq 1, x \in \mathbb{R} \}$  means that the domain is any real number between -6 and 1, but not including -6, but includes 1.
- $R = \{ y \neq 5, y \in \mathbb{R} \}$  means the range can be a real number but cannot equal 5

**Interval Notation** – Use the following as rules for writing interval notation:

1. Always use parentheses around  $\infty$  and  $-\infty$ .  $(-\infty, 14]$
2. If a value is in the domain or range, then use a square bracket  $\{[\}$  around that value.
3. If a value is not in the domain or range, use a round bracket  $\{(\}$  around that value.

*For example,* the following inequalities are written in interval notation:

- a)  $-3 < x < 7$   $(-3, 7)$       b)  $-4 \leq x \leq 10$   $[-4, 10]$   $(-\infty, \infty)$   
c)  $-3 < y \leq 5$   $(-3, 5]$       d)  $y \geq 5$   $[5, \infty)$



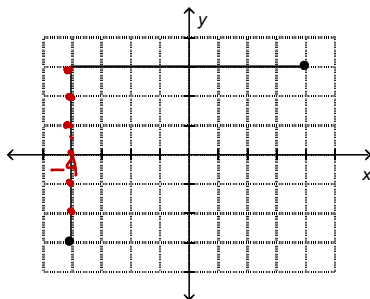
### ***Vertical Line Test for a Function:***

*A graph represents a function when no two points on the graph lie on the same vertical line.*

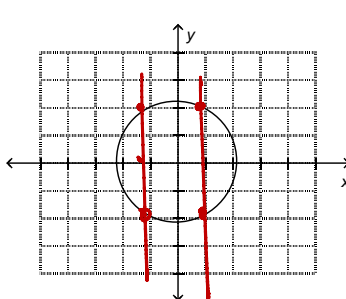
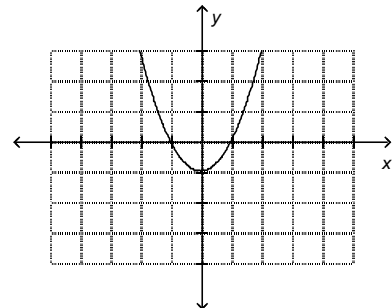
**Example:** Determine if each relation represents a function:

Which of these graphs represents a function?

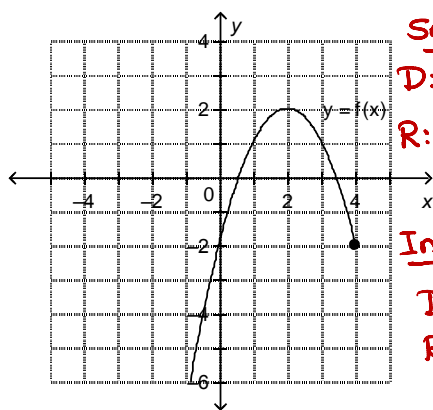
i) Not a Function



ii) Not a Function

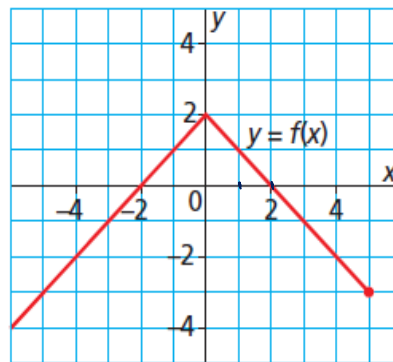
iii) **Function**

**Example:** Determine the domain and range of the graph of each function:



Set Notation  
 $D: \{x \mid x \leq 4, x \in \mathbb{R}\}$   
 $R: \{y \mid y \leq 2, y \in \mathbb{R}\}$

Interval Notation  
 $D: (-\infty, 4]$   
 $R: (-\infty, 2]$

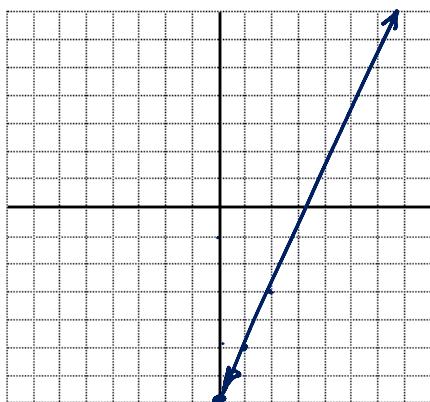


Set Notation  
 $D: \{x \mid x \leq 5, x \in \mathbb{R}\}$   
 $R: \{y \mid y \leq 2, y \in \mathbb{R}\}$

Interval Notation  
 $D: (-\infty, 5]$   
 $R: (-\infty, 2]$

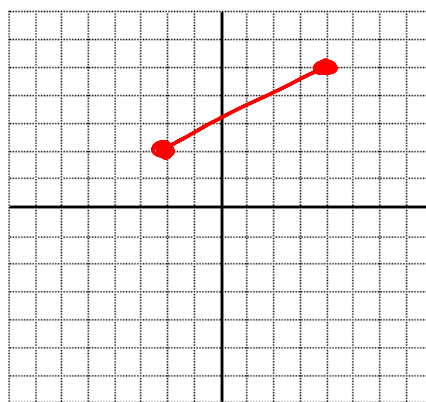
**Example:** Graph the following

i)  $y = 2x - 7$        $y = mx + b$



ii)  $y = \frac{1}{2}x + 3$ ;  $-2 \leq x \leq 4$

$D: [-2, 4]$   
 $R: [2, 5]$



- a) Determine the range value when the domain value is -1.      find  $y$  when  $x = -1$   
 $y = 2(-1) - 7 = \boxed{-9}$
- b) Determine the domain value when the range value is -4.      find  $x$  when  $y = -4$   
 $-4 = 2x - 7$        $2x = 3$        $x = \boxed{\frac{3}{2}}$

**Example:** Josh is a car salesman. He makes a fixed salary of \$500 a month plus a commission of \$600 for every car he sells.

- a) Make a table of values and graph this function for up to 5 cars sold.

#	Salary
0	500
1	1100
2	1700
3	2300

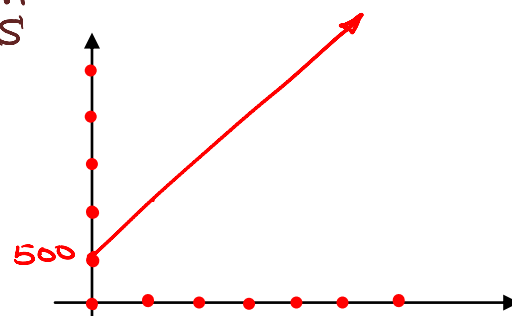
# of cars  $\Rightarrow n$   
 Salary  $\Rightarrow S$

- b) Write an equation to represent this function

$$f(n) = S = 500 + 600n$$

- c) What are the Domain and Range?

$D: \{0, 1, 2, 3, 4, \dots\}$   
 $R: \{500, 1100, 1700, 2300, \dots\}$



**Assignment:** p. 294 Q #7-10, 13, 16, 17

Name: \_\_\_\_\_

*Math 10F & PC H.*

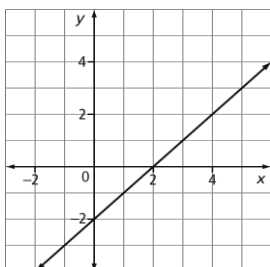
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## Chapter Ch.5 Relations and Functions

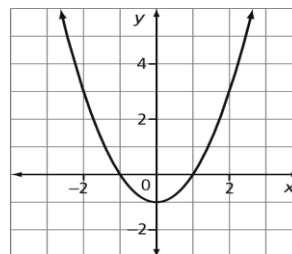
### 5.5 - Graphs of Relations and Functions

1. Give the domain and range of each graph using **words**, **a number line**, **interval notation**, and **set notation**.

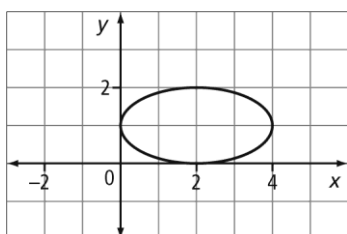
a)



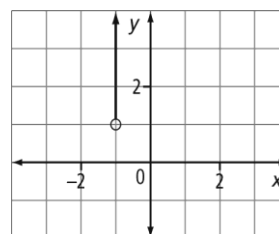
b)



c)

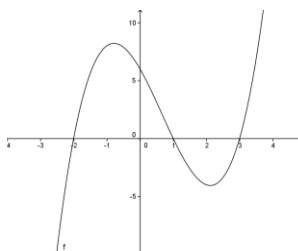


d)

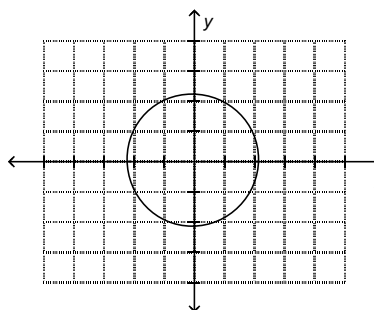


2. Which of these graphs represents a function? Write the domain and the range for each function using **a number line**, **interval notation**, and **set notation**.

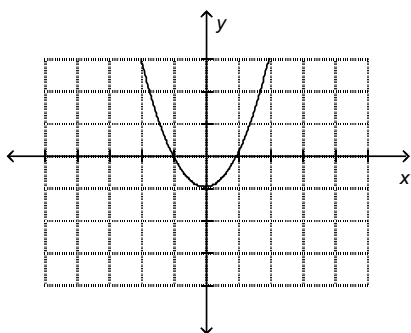
i)



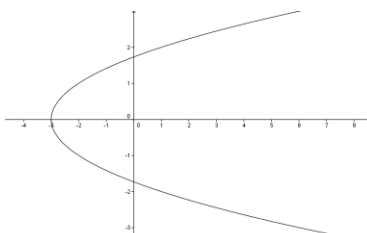
ii)



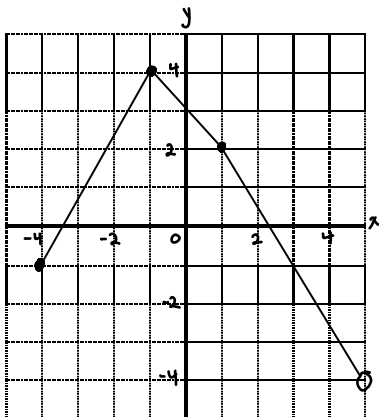
iii)



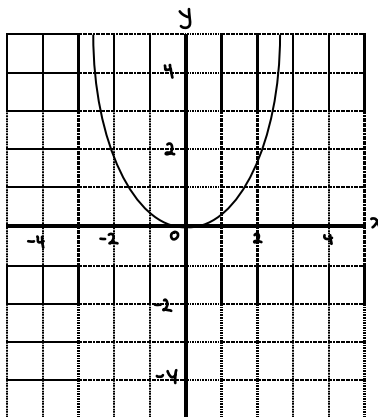
iv)



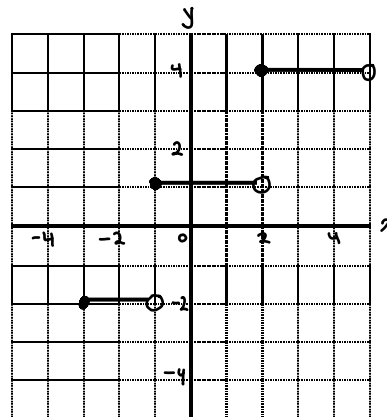
3. Determine the Domain and Range of the following graphs:



D: \_\_\_\_\_  
R: \_\_\_\_\_



D: \_\_\_\_\_  
R: \_\_\_\_\_



D: \_\_\_\_\_  
R: \_\_\_\_\_

4. Which of the following are linear functions?

a)  $y = x^2 - 5$

b)  $3x + 5y = 15$

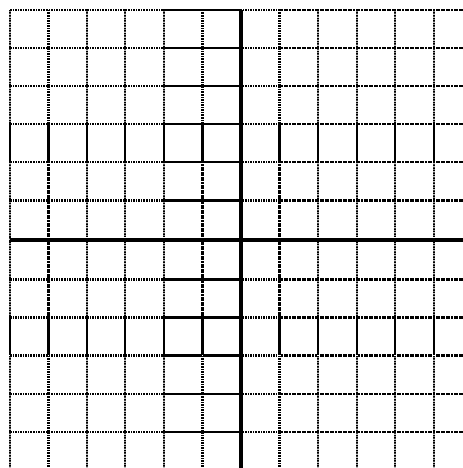
c)  $y = \frac{2x}{5x-1}$

d)  $y = \frac{3x+18}{6}$

e)  $2x + y^2 = 4$

f)  $y = x + \sqrt{x}$

5. Graph  $y = \frac{3}{2}x + 1$  over the domain  $-6 \leq x \leq 2$ . State the range of the resulting function.



6. on the above graph find:

a)  $f(-4)$

b)  $f(2)$

c)  $x$  if  $f(x) = -2$

6. Given  $f(x) = 2x^2 - 5x - 3$ , find

a)  $f(3)$

b)  $f(-6)$

c)  $3f(x)$

d)  $\frac{1}{2}f(x)$

e)  $x$  if  $f(x) = -5$

f) find  $x$  when the value of  $f(x) = 21$